

WHAT IS CLAIMED IS:

1. A optically transparent composite material comprising solid solution inorganic nanoparticles dispersed in a host matrix inert thereto, wherein said nanoparticles are doped
5 with one or more active ions at a level up to about 60 mole% and consist of particles having a dispersed particle size between about 1 and about 100 nm, and said composite material with said nanoparticles dispersed therein is optically transparent to wavelengths at which excitation, fluorescence or luminescence of said active ions occur.

10 2. The composite material of claim 1, wherein at least one active ion is a rare earth element.

3. The composite material of claim 1, wherein said inorganic nanoparticles comprise at least one metal oxide, halide, oxyhalide or chalcogenide salt.

15 4. The composite material of claim 3, wherein said metal inorganic nanoparticles are selected from the group consisting of aluminosilicates, ZnS, ZnSe, PbS, PbSe, CdS and CdSe nanoparticles.

5. The composite material of claim 3, wherein said inorganic nanoparticles comprise at least one metal fluoride or chloride salt.

20 6. The composite material of claim 1, wherein said inorganic nanoparticles comprise at least one Group IV or V semiconductor element or Group III-V, Group II-V or Group II-VI semiconductor compound.

7. The composite material of claim 6, wherein said inorganic nanoparticles comprise at least one Group IV or V semiconductor element selected from the group consisting of Si, Ga and As.

25 8. The composite material of claim 6, wherein said inorganic nanoparticles comprise at least one Group III-V semiconductor compound selected from the group consisting of GaAs, GaN and InN.

9. The composite material of claim 1, wherein said host matrix is an optically transparent material selected from the group consisting of optically transparent glass, optically transparent crystalline materials, optically transparent liquids and optically transparent polymers.

5 10. The composite material of claim 9, wherein said host matrix is a fluoropolymer.

11. The composite material of claim 1, having an attenuation of less than 10 dB/cm.

12. The composite material of claim 1, comprising between about 1 and about 60 vol.% nanoparticles.

10 13. A luminescent device comprising an optical element formed from the composite material of claim 1.

14. The luminescent device of claim 13, wherein said device is a zero-loss link, upconversion light source, standard light source, volumetric display, flat panel display, or a source operating in a wave length/division/multiplexing scheme.

15 15. The luminescent device of claim 13, comprising a plurality of active ions that upon excitation, fluorescence, or luminescence emit a plurality of overlapping emission bands.

16. The luminescent device of claim 13, comprising a plurality of active ions that upon excitation, fluorescence or luminescence, emit a plurality of separate and distinct emission bands.

20 17. The luminescent device of claim 16, wherein said device is a volumetric display or a flat panel display.